CMP–B has monitored the Thana glacier's mass balance every year since 2015

Cryosphere Initiative's Engagement with the National Centre for Hydrology and Meteorology, Bhutan

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Background

The International Centre for Integrated Mountain Development (ICIMOD) works with its implementing partners to develop a coordinated scheme for field and remote sensing monitoring and modelling, and to assess the state and processes of the cryosphere in the Hindu Kush Himalaya (HKH). Activities under this programme are also geared towards improving transboundary water resource management and expanding global knowledge of glaciers, glacial lakes, permafrost, snow, climate change impact, and hydrometeorology in the HKH.

Since 2014, ICIMOD's Cryosphere Initiative and the National Center for Hydrology and Meteorology (NCHM; formerly the Department of Hydromet Services) have developed the Cryosphere Monitoring Programme-Bhutan (CMP-B). Implemented by NCHM and initially funded by the Government of Norway through ICIMOD, CMP-B was from the outset designed as a sustainable, long-term programme that would report to global glacier databases and serve as an important part of the Hindu Kush Himalayan Cryosphere Monitoring Programme. The Thana glacier, situated in the headwaters of the Chamkhar Chhu basin in Bhutan, was selected as a benchmark glacier for monitoring in Bhutan based on a remote sensing assessment and previous field visits there

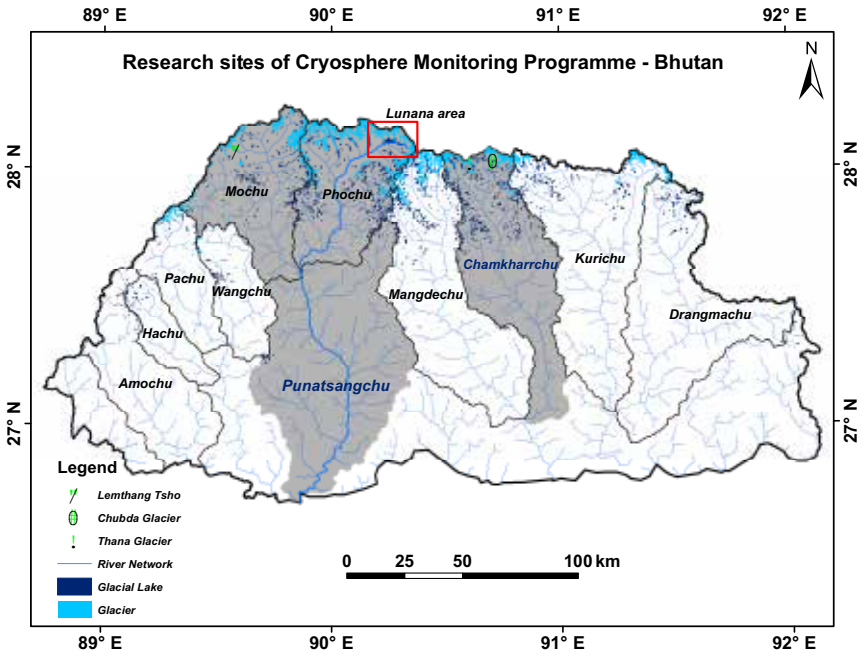

Figure 1: Geographical coverage

by NCHM and the Norwegian Water Resources and Energy Directorate (NVE). The Lunana area was prioritized for glacial lake monitoring and the upper part of the Puna Tsang Chu basin downstream from Lunana was prioritized for socio-economic vulnerability assessment due to the risk of a cascading glacial lake outburst flood (GLOF) disaster.

Figure 1 shows the main cryosphere research sites for data collection in Bhutan. In addition, CMP-B produces remote sensing data, analyses, and inventories on cryosphere for the entire Bhutan Himalaya.

Major ongoing activities

Through collaboration among NCHM, ICIMOD, and NVE, the first field expedition to the Thana glacier under CMP-B took place in autumn 2015. Annual field expeditions take place every September for long-term monitoring of glacier mass balance and river runoff and to maintain automatic monitoring stations in the Chamkhar Chhu basin. GLOF modelling and a socio-economic vulnerability assessment of the communities downstream of selected glacial lakes in the Puna Tsang Chu basin are in their final stage and are expected to be completed by the end of 2018. The socio-economic assessment was carried out by the Watershed Management Division of the Ministry of Agriculture and Forest, Bhutan, in collaboration with NCHM and ICIMOD. The outcome of this assessment will be used to plan disaster risk reduction and mitigation in the river basin. Research is continuing on snow cover and hydrology, such as snow cover area variability in the entire country and variability of river discharge in the Chamkhar Chhu basin.

NCHM, with technical support from ICIMOD, is also developing the Cryosphere Knowledge Hub Bhutan, which will host hydro-meteorological, snow cover, and glacier mass balance data on the Cryosphere in the Bhutan Himalaya. As the national correspondent for Bhutan, NCHM will also submit glacier monitoring data to the World Glacier Monitoring Service (WGMS).

Results and the way forward

The main results under the CMP-B are:

- NCHM and the Cryosphere Initiative have successfully established a long-term Cryosphere monitoring programme in Bhutan.
- NCHM has strengthened its capacity for Cryosphere monitoring through several thematic trainings, on-the-job trainings and workshops in field data collection, remote sensing, data analysis, and database management system organized by ICIMOD. These activities have helped seven women and 12 men develop their skills in Cryosphere monitoring.
- A scientific analysis of the causes, process, evolution, and effects of the Lemthang Tsho glacial lake outburst in June 2015 was completed by ICIMOD experts at the request of NCHM. The experts also assessed the potential for GLOF events in the adjoining valley. The assessment was published in Geoenvironmental Disasters and is available online: https://geoenvironmental-disasters.springeropen.com

In the CMP-B Steering Committee meeting in early 2018, the NCHM and the Cryosphere initiative agreed to move to the second phase of their collaboration under CMP.

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Photo: Inka Koch